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Ref: Response to request for review "Zhang Jiagang waste heat recovery from sulphuric acid production for electricity generation" with the Reference Number 1685

8 July 2008

UNFCCC Secretariat
Martin-Luther-King-Strasse 8
D-53153 Bonn
Germany

Attention: CDM Executive Board

Dear Sir or Madam,

We were informed that our project *"Zhang Jiagang waste heat recovery from sulphuric acid production for electricity generation"* (reference number 1685) was requested for review by the CDM Executive Board. As required by the Executive Board and on behalf of the project participants, we would like to answer the questions and clarify the issues raised in the requests for review as follows:

Request for review: Issue 1

Investment is being made in power industry but IIR benchmark used is for chemical industry. PP must perform investment analysis using power industry benchmark. (Considering that the investment being made is in the power industry, further substantiation is required to confirm that the benchmark reflects the risk profile of this project activity.)

The benchmark internal rate of return (IRR) used for this project is taken from the *Economic Assessment Methods and Parameters for Project Construction* (3rd Edition, 2006), hereafter referred to as "Economic Assessment Methods". This reference is widely used by Chinese authorities for assessing the financial viability of potential new projects. According to regulation No.6 in Chapter 4 of Annex II of the "Economic

Assessment Methods", only when the IRR of a project exceeds the sectoral benchmark IRR, will the proposed project be considered financially feasible. The "Economic Assessment Methods" states that when a project owner invests in a project with key characteristics of another sector rather than its own core business, and has little experience of these characteristics and the project risk, the sectoral benchmark IRR of its own core business will be applied[1].

As stated in the PDD, the proposed project owner is Two Lions (Zhangjiagang) Fine Chemicals Co., Ltd (hereafter TFC). TFC's core business is in fine chemicals and is based in Zhangjiagang, one of China's most important Chemical industry clusters. In the project activity, the project owner will recover waste heat from the sulphuric acid production line for power generation. The project activity is therefore a power generation project installed in a fine chemicals enterprise and will generate electricity not based simply on power demand but based on the ability to maintain levels of production of the underlying chemicals production facility. Furthermore, before the implementation of the project activity, the project owner had no experience in power plant installation and management, so the investment being made is different from a specialised power generation company and the investment decision is a big and risky one for TFC.

Without the additional incentives provided by the CDM, TFC would invest its limited capital in adding capacity to its core business of fine chemicals rather than investing in the proposed project activity. An investment into additional capacity for its core business has delivered proven returns, particular under current demand trends for its products.[2] On the other hand, in the project activity, waste heat used for the power generation is from the sulphuric acid plant, and the stability of the waste heat source and the waste heat recovery system's installation to recover waste heat for power generation depends on the sulphuric acid production line. What's more, barrier analysis in the PDD shows that there are high risks in the Monsanto HRS operation and a possibility that there will be significant negative impacts on the sulphuric acid and other production lines. The risk profile of the project activity is closely linked to that of the chemicals industry and therefore the chemical sectors benchmark should be used. With reference to the "Economic Assessment Methods", the financial benchmark rate of return (after tax) of China's fine chemical industries is 15% for the equity IRR and was duly chosen as the benchmark for the project activity.

Although the project activity is a power production facility it has many characteristics which make it significantly more risky than a traditional power project. This increased risk profile makes it inappropriate to use the power sector benchmark. The Chinese

[1] Methods and Parameters for Economic Assessment of Construction Project (version 3), published by China's National Development and Reform Commission and Construction Ministry, December 2006, paragraph 2, point 2, page 197.

[2] Global sulphuric acid prices have soared to $329/tonne in May 2008, up from just $90/tonne in October 2007. (see e.g.: http://www.moneyweek.com/file/47161/why-the-world-is-crying-out-for-sulphuric-acid.html)

power sector is dominated by large-scale coal generation projects. These projects use mature and proven technology to generate power using an abundant and secure source of fuel.[3] This power is then sold to the grid based on power demand rather than any other factors. The project activity involves a relatively new technology being employed. This new technology captures waste heat from a chemicals production facility. The waste heat is only available when the production facility is operating and therefore availability of power to sell is based more on market demand for the underlying chemical produced. The revenue for the project is therefore dependent not upon simply the power market but also the chemicals market. It therefore has greater risk of lower power production and therefore revenue than a pure power sector project. It is therefore inappropriate to use the power sector benchmark.

In conclusion:

1. Following the guidance used by the relevant authorities which consider project viability in China it is clear that the chemicals sector investment benchmark should be selected;
2. the project is dependent upon the underlying facility and therefore has a risk profile linked to the underlying facility;
3. traditional power projects have quite different risk characteristics compared to this project and it is therefore not appropriate to use the power sector benchmark

Request for review: Issue 2

The DOE will validate investment analysis and indicate how it has validated the input values used in the investment analysis, taking note of the guidance provided in EB 38 paragraph 54.

Besides the response from the DOE, we would like to clarify as follows:

The DOE has validated that the FSR of the project activity was completed in December 2003 and the approval letter of the FSR by the Economic and Trading Commission of Jiangsu Province was issued on 6 January 2005. Considering the incentive of CDM to the project, the project obtained construction permission on 7 May 2004. Therefore, the FSR was still valid at the time of the decision to proceed with the investment in the project activity. All the input values in the investment analysis rely on values from the FSR, which has been approved by the relevant national authorities. The design institute of the FSR is "Engineering Consulting Institute of Jiangsu Province" which has good experience for similar projects in China, and all the values in the FSR were valid at the time of the investment decision.

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[3] The Chinese government does its best to further ensure that power plants are guaranteed coal supply. It recently called on mines and those in charge of transport to ensure that thermal coal is supplied to power plants over other industries. When weather impeded coal shipments from abroad China prioritised thermal coal supplies to power plants: http://uk.reuters.com/article/oilRpt/idUKSHA23542120080226

Request for review: Issue 3

The DOE is requested to explain the essential distinction between the technology used by the project activity and the traditional WHRS used by the four other plants in line with the additionality tool.

Besides the response from the DOE, we would like to clarify as follows:

The waste heat recovery system involved in the project activity is developed by the Monsanto Company from the USA and is their patented technology. In implementing the project activity the project owner faces technology barriers resulting from this patent. The essential distinctions between the technology used by the project activity and traditional WHRS used by the four other plants are as follows:

Firstly, traditional WHRS utilize mature existing boiler technologies which are commonly used in China's sulphuric acid industry. The Monsanto HRS utilizes a double absorption tower to recover reaction heat to generate high temperature acid steam to regenerate steam, which is the core of Monsanto's technology. In the SO_3 gas absorption phase of sulphuric acid production, the Monsanto HRS utilizes the double absorption tower and boiler to replace the intermediary absorption tower and an acid cooler of traditional WHRS. This leads to an enhanced heat recovery and reduced energy waste in the cycle water. The Monsanto HRS double absorption tower is characterised by the high temperature of the gases at the exit, which allows the generation of additional saturated steam, and leads to a greater ratio between the heat recovered and the heat released by the exothermic absorption process.

Secondly, with regards to the waste heat recovery technology used by the project activity, in the SO_3 gas absorption phase of sulphuric acid production, the technical parameter of SO_3 absorption must be controlled between 99.0%-99.7%, which is a much narrower range than projects used in a traditional WHRS. In addition the temperature of the Monsanto HRS must be controlled above 200℃, comparing to 90℃-100℃ of a WHRS utilizing traditional technology. **Table 1** below shows the parameters and requests comparison between the project activity with Monsanto HRS and projects utilizing traditional WHRS, which has been illustrated in the barrier analysis of the PDD.

Table 1: Parameter Comparison

Phase of Sulfuric Acid Production	Parameter and Demands	Routine Project With traditional WHRS	Project activity With Monsanto HRS
SO_3 gas combines with water in HRS Tower	The range of sulfuric acid concentration	Wider (About 98%), Easy to control	Narrow (99.0%-99.7%)[4], Hard to control
	Temperature Demand	Lower temperature (90℃-100℃), Weak causticity;	Higher temperature (225℃[5]), Strong causticity[6];
	Demands for the staff	Must only be familiar with operation and maintenance of routine equipments from domestic sources.	Must become familiar with a new technology, gain in-depth experience of the production process; must obtain ability to identify, analyse and solve any potential malfunctions.

[4] Monsanto Operation Manual---Section10 Acid Heat Recovery System
[5] Monsanto Operation Manual---Section10 Acid Heat Recovery System
[6] Monsanto Operation Manual---Section10 Acid Heat Recovery System

Thirdly, the Monsanto HRS is imported from the USA, and its investment cost is far higher than traditional domestic WHRS. As an article from a professional chemical industry publication states: "*The investment of Monsanto HRS is so high that it is hard to be accepted by common investors. It is especially difficult to promote this technology in developing countries such as China. For example, in the installation of a Monsanto HRS linked to a 1000 tons/day sulphuric acid production facility, the Monsanto HRS accounts for 30% of the total sulphuric acid production facilities investment. The total investment of the project with a Monsanto HRS is 1.4 times higher than the project utilizing a traditional WHRS*".[7]

Yours sincerely,

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[7] 'Waste Heat recovery and utilization from sulphuric acid production', Mr. Yu Xiangdong, Nanjing Chemical Design Institute 'Sulphuric Acid' Volume 3 2000